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March 11, 1998

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Ms. Magalie Roman Salas, Secretary
Federal Communications Commission
Office of the Secretary
1919 M. Street, NW Room 200
Washington, DC 20554

Re: Ex parte - CC Docket No. 96-45 /Proxy Cost Models

Dear Ms. Salas:

On March 10,1998, Richard Clarke, of AT&T, Michael Pelcovits and Chris Fentrup, of MCI, and I met with A. Richard Metzger, Jim Schlichting, Don Stockdale, Brad Wimmer, Lisa Gelb, Charles Keller and Robert Loube of the Common Carrier Bureau. Enclosed is a copy of the presentation that was used to explain what the HAI Model v 5.0a does, how it is different from the BCPM Model, and to respond to questions that have been raised about the HAI Model.

Two copies of this Notice are being submitted to the Secretary of the Commission in accordance with Section 1.1206(a)(2) of the Commission's Rules.

Very truly yours,

Enclosure
cc: Mr. A. Richard Metzger   Mr. B. Wimmer
    Mr. J. Schlichting   Ms. L. Gelb
    Mr. D. Stockdale   Mr. C. Keller
    Mr. R. Loube

HAI Model v 5.0a

■ **What does it do?**

■ **How does it compare to BCPM3?**

AT&T and MCI
March 10, 1998

Purpose of the HAI Model

■ Estimate forward-looking economic cost of basic local exchange service

■ Estimate forward-looking economic cost of unbundled network element

■ Size Universal Service support funding

■ Costs carrier interconnection and access

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All components of the local network are modeled
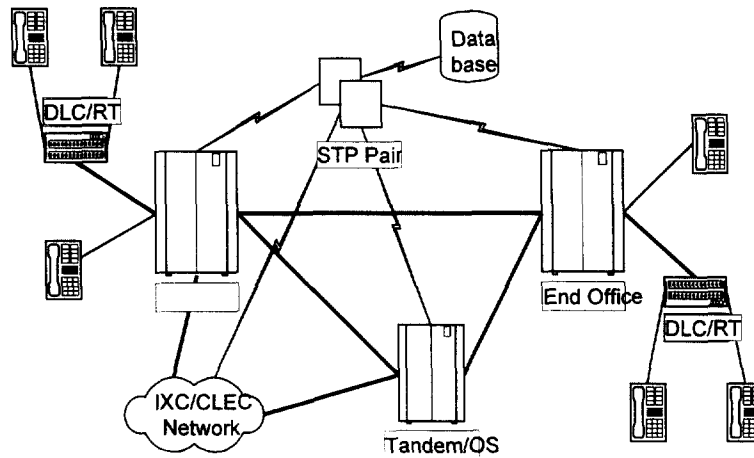
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HM 5.0 Process Stages

Input Data Development

■ Counting and Locating Customers
  ■ PNR National Access Line Model (NALM)
  ■ Locating customers
  ■ Geocoding actual customer locations
  ■ Location gross-up process
■ Clustering process
  ■ Spatially grouping customers that can be served in a single distribution area into such a distribution area

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HM 5.0 Process Stages

Local Network Engineering

■ Loop plant
  ❙ NIDs, drops and terminals
  ❙ Placing copper distribution cables (analog or digital T1) to serve located customer clusters
  ❙ Determining whether to use copper or fiber feeder
  ❙ Directing feeder and subfeeder routes
  ❙ Choice of OSP structure type
■ Switching
  ❙ Host/remote/standalone or blend
 ❙ Use of switch-specific traffic engineering

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HM 5.0 Process Stages

■ Interoffice transport
  ❙ Redundant SONET fiber ring construction
  ❙ Sized based on ring-specific traffic characteristics
  ❙ Tandem switches
■ Signaling
  ❙ STPs/SCPs/signaling links
■ Expenses
  ❙ Return to capital, depreciation, taxes
  ❙ Operating and maintenance expenses
  ❙ Corporate overheads

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Locating Customers - HAI

■ HAI Model determines customer location by geocoding actual latitude and longitude

   ■ accurate to precise street address location

   ■ covers >70% of all customer locations in US

   ■ locations that cannot be geocoded are placed on Census Block boundaries -- a method at least as accurate as any other model's best method

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Maryland Wire Center
CLVLMDCE

Actual points, close-up

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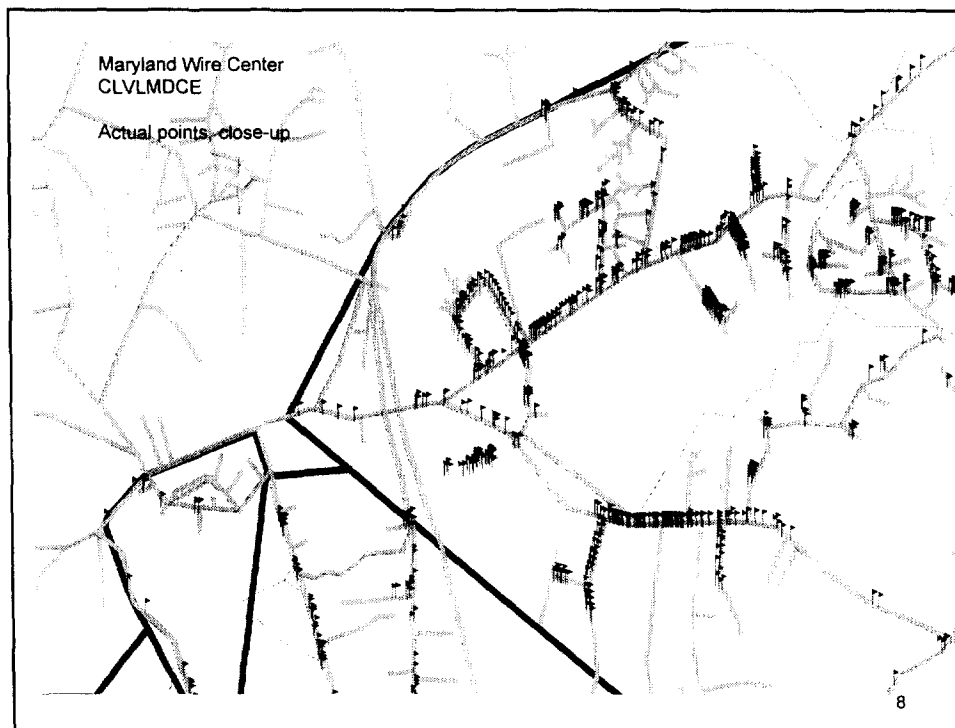
Locating customers - BCPM

■ BCPM assumption that customers are uniformly dispersed along its selected roads is flawed

    I Many roads do not have customers

    I Many customers are not located on BCPM's selected roads

    I Dispersion of customers along roads varies widely

    I Appears to create a West over East bias

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Clustering Customers - HAI

■ Customer locations must be grouped into units that can be efficiently served

    I HM clusters based on spatial proximity of customer locations

    I Subject to engineering constraints

        I No analog copper segment > 18kft

        I < 1800 lines served from a single remote terminal

    I No arbitrary grid cell delineators

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Clustering Customers - HAI

■ HAI Model groups optimally customers without respect to artificial boundaries

■ Determines
   ■ Customers clustered in high rise buildings
   ■ Clusters of customers served through a street grid network
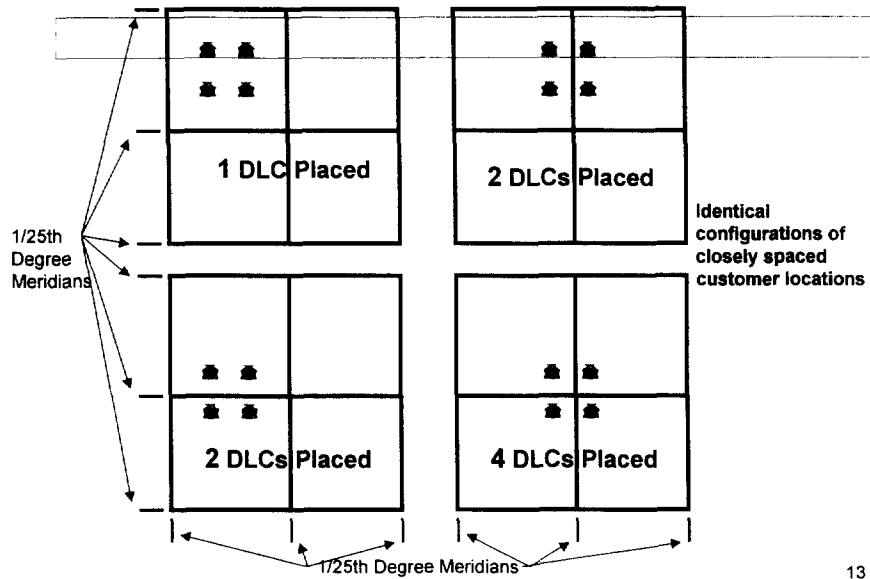   ■ Outlier customer locations dispersed along roads

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Clustering Customers - BCPM

■ BCPM uses "grids" to determine clusters
   ■ Based on 1/25° of latitude and longitude
   ■ Vary by up to 100% in size from north to south -- creates biased support estimates
   ■ Plant built only in grids where BCPM *assumes* populated road segments are found
   ■ Relocates and shrinks these serving areas to tiny road-reduced square areas at "road centroid" (<20% of US area)
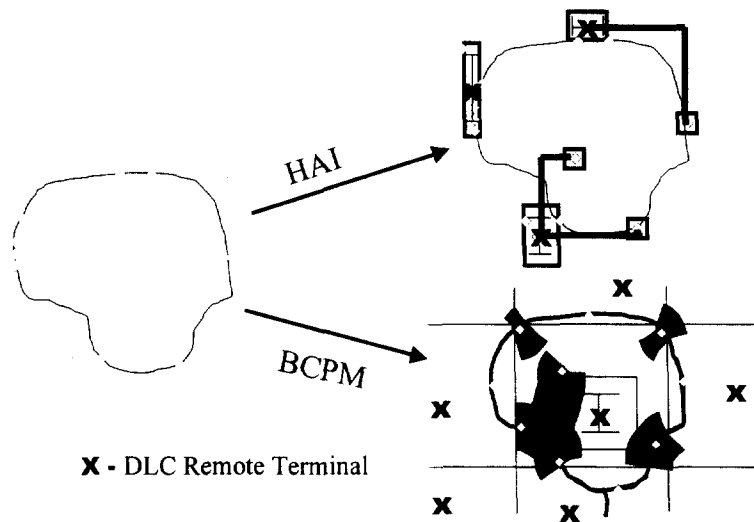
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Random Cost Effects from BCPM3 "Gridding"

1/25th Degree Meridians

1 DLC Placed

2 DLCs Placed

2 DLCs Placed

4 DLCs Placed

Identical configurations of closely spaced customer locations

1/25th Degree Meridians

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Clustering Customers

HAI

BCPM

X - DLC Remote Terminal

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Distribution Engineering - HAI

- The HAI 5.0a Distribution Module takes as input records for each main and outlier cluster within each wire center's service area, containing:
  - Location, area, aspect ratio and line counts of cluster
  - For outlier clusters, identity of nearest other cluster
- Distribution cables
  - Main clusters: copper backbone and branch cables are engineered to "cover" the cluster
  - Outlier clusters: digital T1 copper cables link outlier to nearest main cluster, analog road cables link subscribers within the outlier cluster

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Distribution Engineering-BCPM

- The BCPM engineers inflexibly a square array of backbone and branch cable for all locations
  - Disregards actual area necessary to be served
  - Likely underestimates in rural areas (e.g., where lots are more than 500 feet deep)
  - Frequently fails to place adequate cable to reach all of its assumed customer locations
- Lots are assumed to be square
  - May inflate investment by ~15% and support by ~25%
- Assumption that houses are in middle of lot causes drop lengths to be enormous
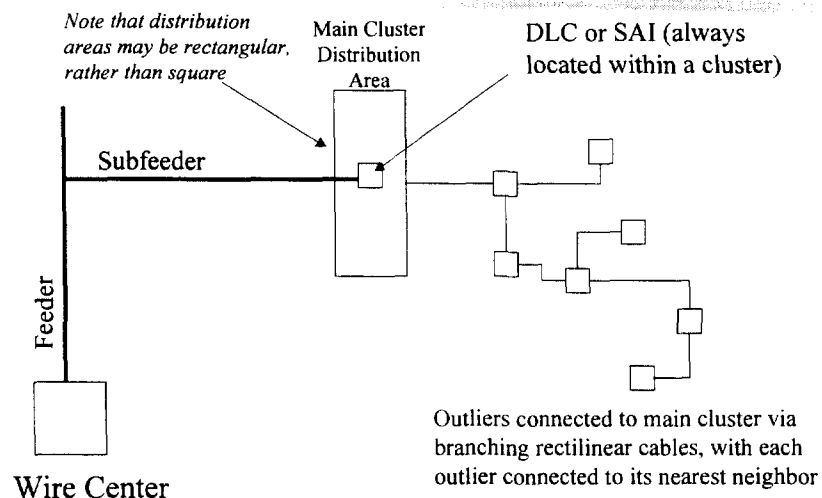
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Feeder Engineering - HAI

■ Feeder cables link SAIs/DLC RTs in each main cluster to the serving wire center

  ▮ Digital fiber if total analog copper distance would exceed 18 kft., or if

  ▮ Fiber is more economical than copper on the route -- based on life-cycle cost analysis

■ Feeder routes may point N-S-E-W, or be steered

■ Structure used for OSP is selected based on:

  ▮ Engineering/zoning limitations of density zone

  ▮ Life-cycle cost comparison based on local terrain and economic conditions
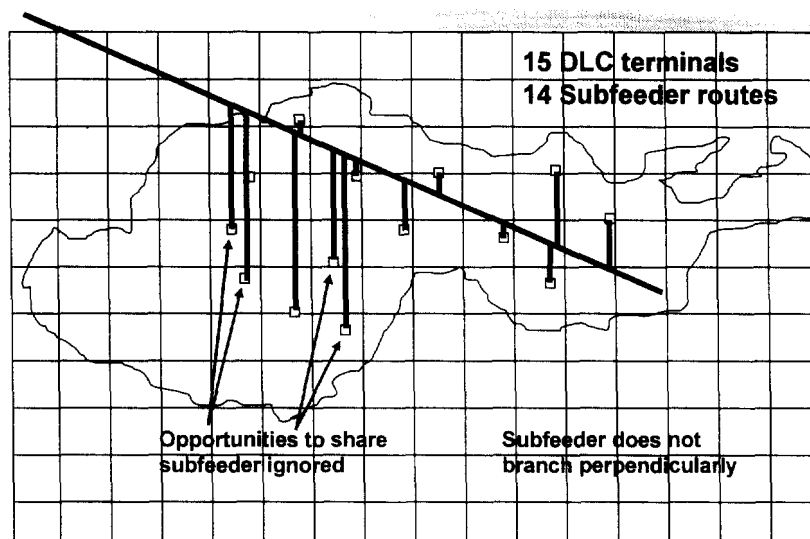
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Engineering Schematic - HAI

Note that distribution areas may be rectangular, rather than square

Main Cluster Distribution Area

DLC or SAI (always located within a cluster)

Subfeeder

Feeder

Wire Center

Outliers connected to main cluster via branching rectilinear cables, with each outlier connected to its nearest neighbor

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Feeder Engineering - BCPM

- ■ Feeder technology and structure determined by rules of thumb
    - ■ Fiber if analog copper distance would exceed 12 kft. target (although it still remains possible for BCPM copper loops to exceed *18 kft.*) or if >4200 lines
    - ■ Choice of OSP structure insensitive to local economics
- ■ Inefficient feeder steering
- ■ Excessive numbers of subfeeder runs
- ■ Non-perpendicular branching of subfeeder

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Feeder Engineering - BCPM

15 DLC terminals
14 Subfeeder routes

Opportunities to share subfeeder ignored

Subfeeder does not branch perpendicularly

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Switch Engineering - HAI

- HAI sizes and costs switches based on:
  - Line counts, by business/residence; DLC usage
  - Traffic statistics (e.g., BHCCS, BHCA, holding times)
- Switch may be designated as:
  - Host, remote or standalone -- with specific host/remote mappings and costs spread evenly; or
  - A "blend" of all types
- Calculated traffic loads at wire center are passed to transport and signaling modules

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Switch Engineering - BCPM

- BCPM relies upon proprietary SCM and SCIS models for level and allocation of switch costs
- Assumes embedded host/remote relationships and levels of DLC usage
- Doesn't engineer small standalone switches
- Doesn't spread total host/remote costs over entire complex
- Doesn't pass calculated traffic loads to transport and signaling modules

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Interoffice Engineering - HAI

- **Transport routes are engineered to link all of *each* company's WCs in a LATA**
  - All on SONET rings, or on spurs (folded SONET rings) to the nearest WC that is on a ring
- **WCs are added to rings pursuant to an optimizing ring-building algorithm**
- **Tandem switching is engineered and linked**
- **Signaling is modeled explicitly**
- **All systems fully redundant**

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Interoffice Engineering-BCPM

- **Uses embedded relationships between end offices, tandem switches and STPs -- no optimization**
- **Intersperses multiple companies' WCs on a single ring**
- **Forces *every* host/standalone ring to pass through a tandem**
- **Switching / transport / signaling loads not linked**
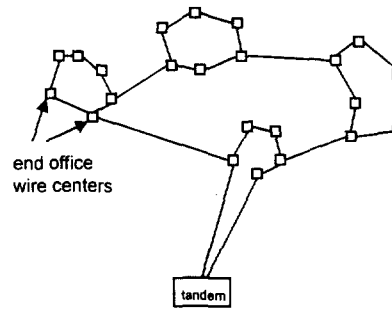- **Signaling input from US West proprietary model**

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Efficient and Inefficient Rings

end office
wire centers
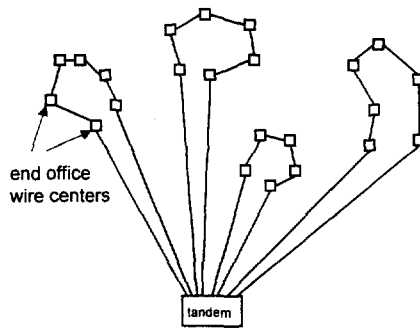
tandem

BCPM:
•*Inefficient ("lollipop")*
•*Insecure (failure at tandem brings down entire network)*

HAI:
•*Efficient ("ring of rings")*
•*Secure*

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Expense Modules

■ The HM 5.0 Expense Modules take as input the network investments calculated in the Distribution, Feeder and SIO modules and calculate unit costs

  ❙ Capital carrying cost of investments

  ❙ Maintenance, repair and operating expenses

  ❙ Common overheads

  ❙ Allocated either per dollar of direct, or per line

■ Produce reports:

  ❙ For USF, UNEs, access and interconnection

  ❙ Disaggregated to the study area, density zone, wire center, CBG or cluster levels

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BCPM Attacks on HAI Customer Loc

∎ BCPM claims its customer location is more
precise because its grid size *may* be smaller
than certain HAI clusters

 ∎ 100% of BCPM customer locations are *assumed*
 ∎ >70% of HAI customer locations are *known*
 ∎ Residual placed at least as accurately as BCPM
 ∎ BCPM road length and location are deceiving

∎ Granularity without data does not provide
accuracy

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BCPM Attacks on HAI Distrib Areas

∎ BCPM claims its distribution areas are located
and sized more accurately than HAI

 ∎ Are not placed where customers or roads are located
 ∎ Are shrunk to a tiny size (<20% of grid area)
 ∎ Are excessive in number
 ∎ All BCPM distribution areas are square
 ∎ Do not ensure copper loops <12 *or* 18 kft.

∎ HAI distribution areas match customer clusters
in location, area and dimensions; and are sized
to meet engineering criteria

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BCPM "Empirical" Analyses

■ BCPM claims HAI overfunds eastern states and underfunds western states

   ■ Appears to be based on three examples, not overall statistical analyses

      | *Anchorage Telephone*

      | *C&P of Maryland*

      | *US West - North Dakota*

   ■ Large HAI Anchorage support due to the misclassification of density associated with some clusters -- has been corrected

   ■ BCPM finds Puerto Rico need ~no support

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BCPM "Empirical" Analyses

■ BCPM draws wrong conclusion about MD vs. ND

   ■ C&P-MD has over 10 times as many total lines as USW-ND -- which drives greatly total USF payouts (HAI Study Area support/line: MD $0.74, ND $6.41)

   ■ HAI does show much greater cost/line in USW-ND than in C&P-MD in their least dense areas, and similar in denser areas (both SA's have 50% of their lines in 2550+ DZs)

|	*Loops*	*Cost/Month*	*Support*
C&P-MD (0-5)	*2,568*	*$ 77.06*	*$ 1,324,065*
USW-ND (0-5)	*11,598*	*$154.47*	*$17,079,522*
C&P-MD (5-100)	*246,493*	*$ 43.13*	*$28,627,104*
USW-ND (5-100)	*16,437*	*$ 41.90*	*$ 1,772,847*

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BCPM Attacks on HAI Cable Lengths

■ BCPM claims that the HAI Model doesn't match
its distribution cable lengths to road length

  ▋ The BCPM example appears to assume, arbitrarily, a
  highly unusual ratio of lots to road (certainly in violation
  of BCPM's professed view that all roads are populated equally)

  ▋ Nevertheless, it is quite reasonable that required
  cable lengths could differ dramatically from road
  mileages

    ▏ All roads need not have cable, (e.g., areas with serpentine,
    nonintersecting roads vs. areas with numerous cross streets)

Road and Cable Lengths
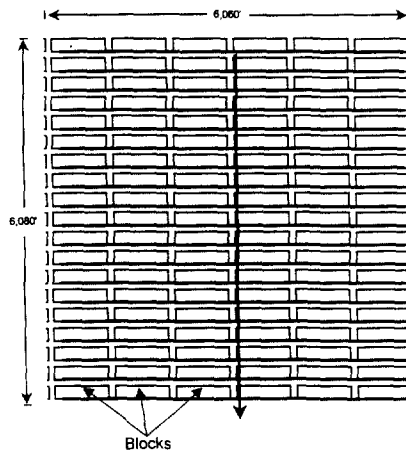
Cable Length Calculations
Branch Cable Length:
4 x 12 x 80' = 3,840'
2 x 11 x 80' = 1,760'
5 x 50' = 250'
5,850'
5,850' x 19 = 111,150'
+ Backbone Cable + 6,080'
Total Cable Length: 117,230'

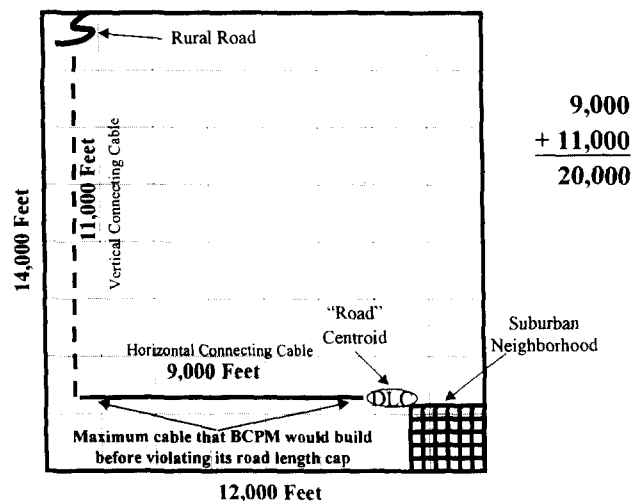| Road Distance |
|---|
| **Without cross streets:** |
| 6,060' x 19 = 115,140' |
| **With cross streets:** |
| 6,080' x 6 = 36,480' |
| 6,060' x 19 = 115,140' |
| Total = 151,620' |

Blocks

Road vs. Cable Lengths

- BCPM's statistics on road lengths are questionable
  - Only include BCPM-selected roads
  - Highways less populated, but lengthy in west
  - Fire roads populated in the east, but excluded
- In any event, BCPM's USW-ND statistics:
  - Suggest HAI matches better than BCPM (affirmed by western state RUS data)
  - Show BCPM doesn't limit cable miles to road miles
- In fact, BCPM frequently doesn't place adequate cable to serve its putative customer locations

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Inadequate BCPM Cable Lengths

Rural Road

Vertical Connecting Cable

14,000 Feet

11,000 Feet

9,000
+ 11,000
20,000

"Road" Centroid

Suburban Neighborhood

Horizontal Connecting Cable
9,000 Feet

Maximum cable that BCPM would build before violating its road length cap

12,000 Feet

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Lines Data

■ BCPM has claimed that business and special access lines data in HAI is faulty
  ▮ HAI uses CB-located business data from PNR
  ▮ BCPM uses an unspecified algorithm to allocate PNR business lines data to CBs
  ▮ HAI uses ARMIS 43-08 special access line counts
  ▮ BCPM appears to use a hodgepodge of possibly inconsistent special access lines data sources
■ Both models should have access to identical ILEC-affirmed lines data for final runs

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"Missing" CBs or WCs?

■ BCPM claims that HAI "misses" many populated Census Blocks
  ▮ This not correct with respect to HAI 5.0a
  ▮ Unclear as to BCPM's basis for this claim
■ BCPM claims that HAI "misses" several wire centers in North Dakota
  ▮ These were sold by US West to an ICO in 1996
  ▮ Then were entered into the LERG by US West as now belonging to a Competitive Access Provider (CAP)
■ All models will have access to complete WC list

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Geocoding & Customer Location

■ BCPM's fundamentally misapprehends the *current* use of geocode data in the HAI Model
  ▪ Coverage of the address data (90+%, not 70%)
  ▪ Use in counting locations by Census Block
  ▪ Use in locating customers within Census Block
  ▪ Use in spatially clustering customers within WCs
  ▪ Use in placing distribution areas
  ▪ Use in determining configuration of distribution plant
■ BCPM only proposes to use geocode data for locating customers -- and at some *future* date

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Summary

■ HAI is:
  ▪ Complete and state of the art
  ▪ Internally consistent
  ▪ Accurate to fine levels of granularity
■ BCPM is:
  ▪ Incomplete
  ▪ Uses "dead end" methodologies
  ▪ Internally inconsistent
  ▪ Measures many costs inaccurately

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